CLAIMS

1. An information coding apparatus comprising a code block conversion unit which codes information bits which are inputted as a block of a two-dimensional image made up from m (where m is a natural number) x n (where n is a natural number) pixels,

wherein the code block conversion unit arranges pixels which represent the information bits in a code area, which is an area of (m - o) x (n - p) pixels within a code block of m x n pixels (where o and p are natural numbers which satisfy $0<o<m$ and $0<p<n$); and arranges no pixels which represent the information bits in a guide area, which is an area of the other pixels within the code block of m x n pixels.

2. An information coding apparatus comprising a code block conversion unit which codes information bits which are inputted as a block of a two-dimensional image made up from m (where m is a natural number) x n (where n is a natural number) pixels,

wherein the code block conversion unit arranges pixels which represent the information bits in a code area, which is an area of (m - o) x (n - p) pixels within a code block of m x n pixels (where o and p are natural numbers which satisfy $0<o<m$ and $0<p<n$); and arranges pixels which represent predetermined information bits in a guide area, which is an area of the other pixels within the code block of m x n pixels.

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3. An information coding apparatus as described in Claim 1 or Claim 2, wherein the code block conversion unit determines the size and the position of a pixel which is arranged in the area of (m - o) x (n - p) pixels, based upon the size of the area of (m - o) x (n - p) pixels.

4. An information decoding apparatus comprising:

a code pattern estimation unit which receives input of a photographed image which has been obtained by photographing a two-dimensional image which consists of an area of m x n pixels, in which a single code block comprises a code area in which (m - o) x (n - p) pixels which represent information bits (where m and n are natural numbers, and o and p are natural numbers which satisfy $0<o<m$ and $0<p<n$) are arranged, and a guide area in which no pixels which represent the information bits are arranged, and which estimates a pattern of the code block based upon the result of relative comparison between the photographed image and images in an ideal state; and

a bit string reconstruction unit which decodes the information bits of the photographed image which is inputted based upon the result of the estimation of the pattern.

5. An information decoding apparatus as described in Claim 4, further comprising:

a positional deviation amount detection unit which detects an amount of positional deviation between pixels of the two-dimensional image and pixels of the photographed image;

an ideal photographed image calculation unit which calculates ideal photographed images of code blocks corresponding to code patterns based upon the amount of positional deviation which has been detected; and

an image comparison unit which compares together the photographed image which is inputted and the ideal photographed images which have been calculated, and calculates relative values, and

wherein the code pattern estimation unit estimates the pattern of the code block from the relative values which have been calculated.

6. An information decoding apparatus as described in Claim 4, further comprising:

a positional deviation amount detection unit which detects an amount of positional deviation between pixels of the two-dimensional image and pixels of a photographed image;

an ideal photographed image calculation unit which calculates ideal photographed images of code blocks corresponding to code patterns based upon the amount of positional deviation which has been detected;

an ideal reconstructed image calculation unit which calculates ideal reconstructed images of code blocks based upon the ideal photographed images which have been calculated, and the amount of positional deviation which has been detected;

a reconstructed image calculation unit which calculates a reconstructed image of the two-dimensional image from the photographed image, based upon the amount of positional deviation which has been detected; and

an image comparison unit which compares together the reconstructed image which has been calculated from the photographed image and the reconstructed images which have been calculated from the code blocks, and calculates relative values, and

wherein the code pattern estimation unit estimates the pattern of the code block from the relative values which have been calculated.

7. An information coding method which codes information bits which are inputted as a block of a two-dimensional image made up from m (where m is a natural number) x n (where n is a natural number) pixels, the method comprising the steps of:

arranging pixels which represent the information bits in a code area, which is an area of (m - o) x (n - p) pixels within a code block of m x n pixels (where o and p are natural numbers which satisfy $0<o<m$ and $0<p<n$); and

arranging no pixels which represent the information bits in a guide area, which is an area of the other pixels within the code block of m x n pixels.

8. An information coding method which codes information bits which are inputted as a block of a two-dimensional image made up from m (where m

is a natural number) x n (where n is a natural number) pixels, the method comprising the steps of:

arranging pixels which represent the information bits in a code area, which is an area of (m - o) x (n - p) pixels within a code block of m x n pixels (where o and p are natural numbers which satisfy 0<o<m and 0<p<n); and

arranging pixels which represent predetermined information bits in a guide area, which is an area of the other pixels within the code block of m x n pixels.

9. An information coding method as described in Claim 7 or Claim 8, wherein the size and the position of a pixel which is arranged in the area of (m - o) x (n - p) pixels are determined based upon the size of the area of (m - o) x (n - p) pixels.

10. An information decoding method comprising the steps of:

receiving input of a photographed image which has been obtained by photographing a two-dimensional image which consists of an area of m x n pixels, in which a single code block comprises a code area in which (m - o) x (n - p) pixels which represent information bits (where m and n are natural numbers, and o and p are natural numbers which satisfy 0<o<m and 0<p<n) are arranged, and a guide area in which no pixels which represent the information bits are arranged;

estimating a pattern of the code block based upon the result of relative comparison between the photographed image and images in an ideal state; and

decoding the information bits of the photographed image which is inputted based upon the result of the estimation of the pattern.

11. An information decoding method as described in Claim 10, further comprising the steps of:

detecting an amount of positional deviation between pixels of the two-dimensional image and pixels of the photographed image;

calculating ideal photographed images of code blocks corresponding to code patterns based upon the amount of positional deviation which has been detected;

comparing together the photographed image which is inputted and the ideal photographed images which have been calculated, and calculating relative values; and

estimating the pattern of the code block from the relative values which have been calculated.

12. An information decoding method as described in Claim 10, further comprising the steps of:

detecting an amount of positional deviation between pixels of the two-dimensional image and pixels of the photographed image;

calculating ideal photographed images of code blocks corresponding to code patterns based upon the amount of positional deviation which has been detected;

calculating ideal reconstructed images of code blocks based upon the ideal photographed images which have been calculated, and the amount of positional deviation which has been detected;

calculating a reconstructed image of the two-dimensional image from the photographed image based upon the amount of positional deviation which has been detected;

comparing together the reconstructed image which has been calculated from the photographed image and the reconstructed images which have been calculated from the code blocks, and calculating relative values; and

estimating the pattern of the code block from the relative values which have been calculated.

13. An information coding program which causes a computer to execute a coding process of coding information bits which are inputted as a block of a two-dimensional image made up from m (where m is a natural number) x n (where n is a natural number) pixels, the coding process comprising the steps of:

arranging pixels which represent the information bits in a code area, which is an area of (m - o) x (n - p) pixels within a code block of m x n pixels (where o and p are natural numbers which satisfy 0<o<m and 0<p<n); and

arranging no pixels which represent the information bits in a guide area, which is an area of the other pixels within the code block of m x n pixels.

14. An information coding program which causes a computer to execute a coding process of coding information bits which are inputted as a block of a two-dimensional imagemade up from m (where m is a natural number) x n (where n is a natural number) pixels, the coding process comprising the steps of:

arranging pixels which represent the information bits in a code area, which is an area of (m - o) x (n - p) pixels within a code block of m x n pixels (where o and p are natural numbers which satisfy $0<o<m$ and $0<p<n$); and

arranging pixels which represent predetermined information bits in a guide area, which is an area of the other pixels within the code block of m x n pixels.

15. An information coding program as described in Claim 13 or Claim 14, wherein, in the coding process, the size and the position of a pixel which is arranged in the area of (m - o) x (n - p) pixels are determined based upon the size of the area of (m - o) x (n - p) pixels.

16. An information decoding program which causes a computer to execute:

a process of receiving input of a photographed image which has been obtained by photographing a two-dimensional image which consists of an

area of m x n pixels, in which a single code block comprises a code area in which (m - o) x (n - p) pixels which represent information bits (where m and n are natural numbers, and o and p are natural numbers which satisfy 0<o<m and 0<p<n) are arranged, and a guide area in which no pixels which represent the information bits are arranged, and of estimating a pattern of the code block based upon the result of relative comparison between the photographed image and images in an ideal state; and

a process of decoding the information bits of the photographed image which is inputted based upon the result of the estimation of the pattern.

17. An information decoding program as described in Claim 16, which further causes the computer to execute:

a process of detecting an amount of positional deviation between pixels of the two-dimensional image and pixels of the photographed image;

a process of calculating ideal photographed images of code blocks corresponding to code patterns based upon the amount of positional deviation which has been detected;

a process of comparing together the photographed image which is inputted and the ideal photographed images which have been calculated, and calculating relative values; and

a process of estimating the pattern of the code block from the relative values which have been calculated.

18. An information decoding program as described in Claim 16, which further causes the computer to execute:

a process of detecting an amount of positional deviation between pixels of the two-dimensional image and pixels of the photographed image;

a process of calculating ideal photographed images of code blocks corresponding to code patterns based upon the amount of positional deviation which has been detected;

a process of calculating ideal reconstructed images of code blocks based upon the ideal photographed images which have been calculated, and the amount of positional deviation which has been detected;

a process of calculating a reconstructed image of the two-dimensional image from the photographed image based upon the amount of positional deviation which has been detected;

a process of comparing together the reconstructed image which has been calculated from the photographed image and the reconstructed images which have been calculated from the code blocks, and calculating relative values; and

a process of estimating the pattern of the code block from the relative values which have been calculated.